

YAMAMOTO, N. et al.  
Serial No. 10/087,994

Atty Dkt: 900-420  
Art Unit: 1746

### **REMARKS/ARGUMENTS**

Reexamination of the captioned application is respectfully requested.

#### **A. SUMMARY OF THIS AMENDMENT**

By the current amendment, Applicants basically:

1. Thank the Examiner for allowance of claims 9, 12, 28, 30, 32 and 34.
2. Thank the Examiner the indication of allowable subject matter in claims 5, 18 and 25.
3. Rewrite claim 18 as an independent claim.
4. Cancel claims 16 and 17 without prejudice or disclaimer.
5. Amend independent claims 1, 3, 14, 15, 27, 29, 31, and 33.
6. Respectfully traverse all prior art rejections.

#### **B. PATENTABILITY OF THE CLAIMS**

Claims 1-4, 6-8, 10, 11, 13-17, 19, 20, 27, 29, 31 and 33 stand rejected under 35 USC 103(a) as being unpatentable over the Suzuki et al reference. Claims 21-24 and 26 under 35 USC 103(a) as being unpatentable over the Palmore et al reference. All prior art rejections are respectfully traversed for at least the following reasons.

Although deemed evident from in their previous wording, independent claims 1, 8, 27, and 31 have been amended to specify more explicitly that the layer containing the biochemical catalyst is formed within the housing between the anode-side supply inlet and the anode. For support, *see*, e.g., Fig. 1 and page 12, lines 4-16 of the specification. Similarly, and in view of essentially the same support, independent claims 3, 11, 14, 15, 29, and 33 have been amended to specify that the filter (containing the layer containing the biochemical catalyst) is formed within the housing in the supply section.

YAMAMOTO, N. et al.  
Serial No. 10/087,994

Atty Dkt: 900-420  
Art Unit: 1746

Independent Claims 1, 3, 8, 11, 14, 15, 27, 29, 31 and 33

The office action opines that it would be obvious to a skilled person in the art that a supply section for supplying a material for fuel be placed at an appropriate position within a housing which accommodates a fuel cell, and thus that the feature of the present invention is not considered to distinguish over the disclosure of Suzuki et al. (Applied Biochem. and Bioeng., 1983). However, Suzuki et al does not disclose or suggest the claim feature that the layer containing the biochemical catalyst for generating hydrogen is located within the housing of the polymer electrolyte fuel cell, the housing having the supply inlet on the anode side of the cell for supplying the material for fuel.

In the above regard, Fig. 8 (page 298) of Suzuki et al purportedly illustrates a wet-type hydrogen-oxygen fuel cell; Fig. 10 (page 300) purportedly illustrates a gas-type hydrogen-oxygen fuel cell using immobilized *Clostridium butyricum*. In neither the Fig. 8 nor the Fig. 10 Suzuki fuel cell does it appear that the immobilized *Clostridium butyricum* is in a "layer", but rather in a packet-bed reactor (2) in Fig. 8 and a jar fermenter (3) in Fig. 10. Nor is the Suzuki immobilized *Clostridium butyricum* contained in a same housing with an anode and cathode.

Suzuki's immobilization takes the form of a gel, and that the Suzuki gel is not provided with any specific structure or configuration. As such, Suzuki does not suggest a layer containing a biochemical catalyst. Nor does Suzuki teach or suggest placement of the layer in a housing which also integrally houses an anode and a cathode.

When decomposing a material for fuel to generate hydrogen, there is conventionally a need to remove carbon monoxide (CO), and thus a need to provide a section for reforming CO in addition to (a) a supply section for supplying a material for fuel to generate hydrogen and (b) a fuel cell. Conventionally, it is not possible to

YAMAMOTO, N. et al.  
Serial No. 10/087,994

Atty Dkt: 900-420  
Art Unit: 1746

integrate a layer containing a biochemical catalyst and the section for reforming CO with a housing which accommodates the fuel cell because the section for reforming CO is a section in which reaction occurs at a high temperature. Therefore, heretofore locating a layer containing a biochemical catalyst within a fuel cell housing would not be contemplated or expected.

Applicants' use of the layer containing the biochemical catalyst to generate hydrogen makes it possible to generate hydrogen without involving the generation of CO. This in turn makes it possible to integrate the layer containing the biochemical catalyst in the housing having the supply inlet on the anode side of the cell for supplying the material for fuel and thus to achieve a reduce in the size of the system which would be otherwise impossible (*see, e.g.,* page 9, lines 2-7 of the specification).

For the above reason, independent Claims 1, 3, 8, 11, 14, 15, 27, 29, 31 and 33 are non-obvious and accordingly their dependent Claims 2, 4-7, 10 and 13 are also non-obvious.

Independent claims 21 and 23

Argument for obviousness of the independent Claims 21-24 and 26 The Examiner has rejected Claims 21-24 and 26 as being obvious (as lacking inventive step) over Palmore et al. (J. Electroanal. Chem., 1998, Cited document 2).

Another claim feature of claims 21 and 23 is that the layer containing the biochemical catalyst, which decomposes methanol, formaldehyde and/or formic acid as the material for fuel to generate hydrogen, is formed between the anode-side supply and the anode.

YAMAMOTO, N. et al.  
Serial No. 10/087,994

Atty Dkt: 900-420  
Art Unit: 1746

The office action opines that it would be obvious to a skilled person in the art to place an immobilized bacteria at an appropriate position within the housing which accommodates the fuel cell, and thus allegedly the feature of the present invention is not considered to distinguish over Palmore. However, Palmore does not disclose the claim feature that the enzymes for reacting with the methanol are immobilized on a "layer" (see: the last paragraph of Allowable Subject Matter 6 in the previous Office Action of March 8, 2005).

In the above regard, the office action properly admits that Palmore does not expressly state that bacteria is immobilized as a layer adjacent the anode or as a filter upstream from the fuel cell. The office action points to scheme 3 on page 159 of Palmore as showing fuel cell structure (but of an enzyme solution biofuel cell). The fuel cell has a Nafion perfluorinated membrane. The office action opines that reference on page 156 of Palmore to an immobilized enzyme would cause the artisan to place "an immobilized layer" (emphasis added by us) at an appropriate position in the system. However, there is no specific mention in Palmore of how immobilization would be accomplished, and nothing to suggest that immobilization would occur in a layer type structure.

For the above reason, the independent Claims 21 and 23 are non-obvious (has inventive step) and their dependent Claims 22, 24 and 26 are also non-obvious.

Thus, neither Suzuki et al nor Palmore et al. disclose the claim features that the layer containing the biochemical catalyst (which decomposes the material for fuel to generate hydrogen) is placed adjacent the anode of the fuel cell, or the claim feature that the layer containing the biochemical catalyst is located within the housing which accommodates the fuel cell. Moreover, neither Suzuki et al nor Palmore et al. disclose the claim feature that the layer containing the biochemical catalyst (which decomposes methanol to generate hydrogen) is placed adjacent the anode of the fuel cell, or the claim

YAMAMOTO, N. et al.  
Serial No. 10/087,994

Atty Dkt: 900-420  
Art Unit: 1746

feature that the layer containing the biochemical catalyst is located within the housing which accommodates the fuel cell.

### C. MISCELLANEOUS

In view of the foregoing and other considerations, all claims are deemed in condition for allowance. A formal indication of allowability is earnestly solicited.

The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

Should the Examiner feel that an interview with the undersigned would facilitate allowance of this application, the Examiner is encouraged to contact the undersigned.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By:



H. Warren Burnam, Jr.  
Reg. No. 29,366

HWB:lsh  
1100 North Glebe Road, 8th Floor  
Arlington, VA 22201-4714  
Telephone: (703) 816-4000  
Facsimile: (703) 816-4100